WHAT IS CLAIMED IS:

1. A filtering system comprising:

a first input that receives a signal contaminated with noise;

a second input that receives a noise reference signal;

a set of M notch filters, wherein each of the M notch filters is responsive to a corresponding tuning coefficient so as to attenuate a corresponding noise frequency in the signal contaminated with noise;

a tuning parameter generator coupled to the second input, wherein the tuning parameter generator is arranged to generate a tuning parameter corresponding to a fundamental frequency of the noise based on the noise reference signal;

a filter coefficient generator coupled to the tuning parameter generator and to each of the M notch filters, wherein the filter coefficient generator is responsive to the tuning parameter so as to provide each of the M notch filters with the corresponding tuning coefficient; and,

a gain normalizer coupled to the M notch filters and to the first input, wherein the gain normalizer is arranged to adjust an overall gain of the M notch filters.

2. The apparatus of claim 1 wherein the signal contaminated with noise comprises a digital signal.

3. The apparatus of claim 1 wherein each of the M notch filters comprises a second-order single-multiplier-per-order Gray-Markel lattice filter having an α coefficient multiplier arranged to set a −3 dB notch bandwidth of the corresponding filter and having a coefficient multiplier arranged to set the center frequency of the corresponding notch in response to the corresponding tuning coefficient.

4. The apparatus of claim 3 wherein the −3 dB bandwidth of each of the M notch filters is f_{BW}, wherein the -3 dB bandwidth is determined by setting α in accordance with the following equation:

$$\alpha = \frac{1 - \tan(\pi f_{BW} T)}{1 + \tan(\pi f_{BW} T)}$$

and wherein T is a sampling period.

5. The apparatus of claim 4 wherein the gain of the gain normalizer is set in accordance with the following quantity:

$$\left[\frac{(1+\alpha)}{2}\right]^{M}.$$

6. The apparatus of claim 4 wherein the gain normalizer is coupled between the first input and a first of the M notch filters.

7. The apparatus of claim 3 wherein the -3 dB bandwidth of each filter is the same.

8. The apparatus of claim 1 wherein the tuning parameter generator comprises a frequency locked loop.

9. The apparatus of claim 1 wherein the tuning parameter generator comprises a phase locked loop.

10. The apparatus of claim 1 wherein the corresponding tuning coefficient supplied to an nth one of the M notch filter has a value in accordance with the following equation:

$$\beta_n = \cos(2\pi f_0 n T)$$

wherein β_n is the corresponding tuning coefficient supplied to the nth one of the M notch filter, wherein f_0 is the fundamental frequency of the noise, and wherein T is a sampling period.

11. The apparatus of claim 10 wherein the tuning parameter generated by the tuning parameter determination device is β_1.

12. The apparatus of claim 11 wherein the tuning parameter generator comprises a frequency locked loop.

13. The apparatus of claim 11 wherein the tuning parameter generator comprises a phase locked loop.

14. The apparatus of claim 11 wherein the tuning parameter β_1 is provided as an input to the filter coefficient generator.

15. The apparatus of claim 14 wherein the filter coefficient generator comprises a second-order recursive loop whose successive output samples are β_1, β_2, . . . β_N, wherein the Nth harmonic is the highest frequency of interest, and wherein the input to the filter coefficient generator provides a multiplier coefficient and an initial condition to the second-order recursive loop.

16. The apparatus of claim 15 wherein the filter coefficient generator contains instructions that determine which of the N output samples are to be supplied to the M notch filters such that $M \leq N$.

17. The apparatus of claim 16 further comprising a data bus coupled between the output of the filter coefficient generator and the M notch filters, and wherein the $M \leq N$ output samples from the filter

coefficient generator are loaded via the data bus into notch filter multipliers of the M notch filters.

18. A method comprising:

generating a tuning parameter corresponding to a fundamental frequency of noise in a signal contaminated with the noise;

generating tuning coefficients β_1, β_2, β_3, . . ., β_M in response to the tuning parameter, wherein the tuning coefficients β_1, β_2, β_3, . . ., β_M correspond to the fundamental frequency and to harmonics of the fundamental frequency; and,

filtering the signal with notches positioned at frequencies determined by the tuning coefficients β_1, β_2, β_3, . . ., β_M so that the noise is attenuated.

19. The method of claim 18 wherein the filtering of the signal imposes a gain on the signal, wherein the method further comprises normalizing the signal prior to the filtering, and wherein the normalizing is based on the gain imposed on the signal.

20. The method of claim 18 wherein the signal contaminated with noise comprises a digital signal contaminated with noise.

21. The method of claim 18 wherein the filtering of the signal comprises:

multiplying the signal by a gain coefficient; and,

multiplying the signal by the tuning coefficients β_1, β_2, β_3, . . ., β_M.

22. The method of claim 21 wherein the multiplying of the signal by the gain coefficient sets a bandwidth of the notches, and wherein the multiplying of the signal by the tuning coefficients β_1, β_2, β_3, . . ., β_M sets a center frequency of the notches.

23. The method of claim 18 wherein the filtering of the signal is performed in stages and wherein each stage comprises:

multiplying the signal by a gain coefficient; and,

multiplying the signal by a corresponding one of the tuning coefficients $\beta_1, \beta_2, \beta_3, \ldots, \beta_M$.

24. The method of claim 23 wherein the multiplying of the signal by the gain coefficient sets a bandwidth of the notches, and wherein the multiplying of the signal by a corresponding one of the tuning coefficients $\beta_1, \beta_2, \beta_3, \ldots, \beta_M$ sets a center frequency of the notches.

25. The method of claim 24 wherein the bandwidth is f_{BW}, and wherein the bandwidth is determined by setting the gain coefficient in accordance with the following equation:

$$\alpha = \frac{1 - \tan(\pi f_{BW} T)}{1 + \tan(\pi f_{BW} T)}$$

wherein α is the gain coefficient, and wherein T is a sampling period.

26. The method of claim 25 wherein the filtering of the signal imposes a gain on the signal, wherein the method further comprises normalizing the

signal prior to the filtering, wherein the normalizing is based on the gain imposed on the signal, wherein the gain of the gain normalizer is set in accordance with the following quantity:

$$\left[\frac{(1+\alpha)}{2}\right]^{M}.$$

27. The method of claim 18 wherein the generation of tuning coefficients β_1, β_2, β_3, ..., β_M comprises generating the tuning coefficients β_1, β_2, β_3, ..., β_M in accordance with the following equation:

$$\beta_n = \cos(2\pi f_0 nT)$$

wherein f_0 is the fundamental frequency of the noise, wherein T is a sampling period, and wherein n varies from 1 to M.

28. A notch filter comprising:

an input that receives an input signal contaminated with noise, wherein the noise has a fundamental frequency;

an output that provides an output signal from the notch filter, wherein the output signal is substantially free of a harmonic of the fundamental frequency of the noise;

a first summer that sums the input signal with an output of a first delay, wherein the first summer has an output providing the output signal;

a first multiplier that multiplies the output signal by a gain coefficient;

a second summer that subtracts an output of the first multiplier from the input signal;

a third summer that subtracts an output of a second delay from an output of the second summer;

a second multiplier that multiplies an output of the third summer by a tuning coefficient related to the harmonic frequency;

a fourth summer that subtracts an output of the second multiplier from the output of the second summer, the fourth summer having an output coupled as an input to the second delay; and,

a fifth summer that subtracts the output of the second multiplier from the output of the second delay,

wherein an output of the fifth summer is coupled as an input to the first delay.

29. The notch filter of claim 28 wherein the gain coefficient sets a bandwidth of the notch filter, and wherein the tuning coefficient sets a center frequency of the notch filter.

30. The notch filter of claim 29 wherein the bandwidth is f_{BW}, and wherein the gain coefficient is determined in accordance with the following equation:

$$a = \frac{1 - \tan(\pi f_{BW} T)}{1 + \tan(\pi f_{BW} T)}$$

wherein α is the gain coefficient, and wherein T is a sampling period.

31. The notch filter of claim 30 wherein a gain normalizing quantity is applied to the input signal upstream of the notch filter, and wherein the gain normalizing quantity is set in accordance with the following quantity:

$$\left[\frac{(1+\alpha)}{2}\right]^M.$$

32. The notch filter of claim 28 wherein the tuning coefficient has a value in accordance with the following equation:

$$\beta_n \cos(2\pi f_0 nT)$$

wherein β_n is the tuning coefficient, wherein f_0 is the fundamental frequency of the noise, wherein n designates the harmonic, and wherein T is a sampling period.

33. The notch filter of claim 28 having a transfer function in accordance with the following equation:

$$F(z,n) = \frac{1 - 2\beta_n z^{-1} + z^{-2}}{1 - \beta_n (1+\alpha) z^{-1} + \alpha z^{-2}}$$

wherein F(z,n) is the transfer function, wherein n designates the harmonic, wherein β_n is the tuning

coefficient, wherein α is a gain coefficient, wherein z^{-1} represents a first order delay, and wherein z^{-2} represents a second order delay.

34. A notch filter that applies a transfer function F(z,n) to an input signal contaminated with noise in order to produce an output signal in which a harmonic of the noise is attenuated, wherein the transfer function F(z,n) is defined by the following equation:

$$F(z,n) = \frac{1 - 2\beta_n z^{-1} + z^{-2}}{1 - \beta_n (1+\alpha) z^{-1} + \alpha z^{-2}}$$

wherein n designates the harmonic, wherein β_n is a tuning coefficient related to a center frequency of a bandwidth of the notch filter, wherein α is a quantity related to the bandwidth of the notch filter, wherein z^{-1} represents a first order delay, and wherein z^{-2} represents a second order delay.

35. The notch filter of claim 34 wherein β_n defines the center frequency of the bandwidth of the notch filter.

36. The notch filter of claim 34 wherein α defines the bandwidth of the notch filter.

37. The notch filter of claim 36 wherein β_n defines the center frequency of the bandwidth of the notch filter.